Birth and Evolution of Stars: Does Heritage Matters in Science?

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Today's emphasis on economic activity based on knowledge and innovation is leading industrialized as well as developing nations to foster policies to advance their science and technology (S&T) systems. At the core of these efforts are a set of policies that expand the scientific base and attract, create and retain highly talented scholars. Nations around the world have been pursuing a variety of strategies to this effect. The most common approach relies on an effort to grow the size of their research system, aiming to build a critical mass of researchers across a variety of areas. For example, the Mexican Government has enlarged its scientific system by funding the training of scientist (with national and international fellowships) and developing repatriation programs for national researchers. In contrast, a smaller number of nations have made a particular effort to attract and retain some of the world's most accomplished and promising minds. A good example of such strategy is Canada's Research Chairs Program. The underlying assumption is that these key scientists will make groundbreaking scientific discoveries, but also help create and develop internationally renowned research centers, improve universities' capacity for generating and applying new knowledge and train the next generation of highly qualified personnel.

This work analyzes the role of scientific stars (i.e. the most accomplished and salient researchers) in a science system. We characterize stars along several dimensions, including productivity, impact, but also level of collaboration and the capacity to broker relations. These various roles are important because these researchers might contribute through their publications and citations, but also as a source of ideas, exposure to other eminent scientist, access to key resources, etc. We then assess how relevant these eminent scientist are for the development of a system: This means understanding how much they contribute to the output and impact of the system, as well as how influential are them in creating/training new stars. To accomplish this goal, we will characterize the entry environment for researchers (e.g. institutional affiliation, if they belong to a nurturing co-authorship group) and identify how they enter a particular field of knowledge (i.e. by the hand of an established or future star, by themselves, with co-authors that have average productivity). We then track the movement of researchers across scientific fields, institutions and co-authorship groups over two decades and

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establish the extent to which they collaborate with prominent researchers in their scientific careers. We then explore how the nature of entry relates to performance and impact.

The analysis is based in the entire universe of researchers active in the field of physics and applied physics in Mexico from 1982 to 1999. Since the early eighties these two areas of knowledge have had an impressive development, growing 12% each year and accounting for 14% of all the papers published in this country within this period of time. Preliminary results show that 23% of the researchers entered the system by the hand of a star, 2% did it as a star and the rest did it alone or with co-authors with average productivity. In terms of productivity, scientist that entered the system by the hand of a star or as a star where on average 36% and 285% (respectively) more productive than researchers that did it alone or with co-authors with average productivity. In addition, researchers that were under the influence of a star or were one remain longer in the system when compared to the other type of scientist. This suggests that the way a scientist entre the system influence it's performance and the impact he or she has in the system.